

Agricultural Research Service
Small Farm Research Agri-news

**Dale Bumpers Small Farms
Research Center Newsletter**
Booneville, Arkansas

**Greetings from the Research Leader,
Dr. Phillip Owens**



The Dale Bumpers Small Farms Research Center started a new fiscal year on October 1, 2021. At this time, it is always good to look back to see the advancements we have made over a year. The scientific team published 31 refereed journal articles which is almost 8 publications per scientist. The output from our scientist is far above the average for most research institutions. Our philosophy is that a research project is never fully complete until the paper is reviewed and approved by peers so that others can benefit from the work. We were awarded

\$2.6 million in research grant awards this year. We were also lead scientists on a \$37 million grant by Howard G. Buffett Foundation (not included in Year 2021) which will begin in Year 2022. This grant is one of the largest international agricultural grants awarded and will bring more international attention to the Dale Bumpers Small Farms Research Center. Our research center is focused on conducting fundamental research that can be applied today, addressing future needs. Our research scientists are developing methods using computer-based machine learning and deep learning for applications using artificial intelligence. We see a future where sensors, satellites, and equipment will communicate to optimize the complex farm system operations.



Our team also focused on infrastructure this year. We completed installation of a voice over IP phone system, installed eco-friendly drinking fountains, installed 72 handicap accessible doorknobs on the facility, and completed full HVAC replacement for 2 buildings. We procured and erected 7 new 30' x 50' x 14' metal shade buildings, 40 - 18' x 21' x 7' open car port shade structures, 6 - 18'x21x7' three sided enclosed carports for animal shade and built 12 concrete pads for watering systems and refurbished 1.2 miles of roads to complete 18 animal research grazing paddocks. We erected one 60'x100' metal hay barn to preserve hay for winter feeding. (continued on page 2).

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(continued from page 1) We also updated our forage grinding room with high-capacity air exhaust to remove dust for employee safety. There were several projects completed this year which demonstrate our employees' commitment to the research center.

Other operational improvements include animal tracking with the use Cattlemax for record keeping. This electronic file system permits tracking of every cow from birth to market so that health records, growth rate, and overall performance can be evaluated. We also enrolled in the University of Arkansas Extension program "GoGreen" which certifies animal health records and welfare from birth to market. Occasionally, we must auction our excess animals to maintain a proper herd size. Our sheep team used an online auction system and were able to send our top parasite resistant genetics around the US. Dr. Burke leads a program that focuses multiple strategies to manage parasites and her genetics are highly desired within the sheep community. The sheep and cattle programs are a strength of our Center as these commodities are crucial for small farm success in Arkansas.

This year we added 7 new employees to our team. In June, we added Dr. Zamir Libohova who brings a strong work ethic, creativity and experience in remote sensing and machine learning. He has hit the ground running and has already contributed to field work and our publication output. We have added Dr. Suman Rohila who fills a critical role in the laboratory and has already made a substantial contribution by moving forward on projects that were stalled due to a lack of lab support. We had Harrison Smith for 8 months and he has left the Center to pursue a PhD at the U of A; however, he will complete 2 publications from his work at the Center. The field crew has benefitted from hiring Michelle Armstrong, Jacob Nichols, Ethan Fairbanks and Wyatt Rongey. These four new employees are great people, outstanding workers and are getting the job done. I am proud to have each individual on our team.

On August 30, 2021, John Hampton and the Booneville USDA committee invited U.S. Senator John Boozman, U.S. Congressman Bruce Westerman, Arkansas State Senator Gary Stubblefield, Arkansas State Representative Jon Eubanks and multiple staff members to visit the research center to observe the technology applications we have developed. We had demonstrations highlighting drone data capture, GPS auto-steer tractor optimization, GPS collars on sheep to track grazing patterns, genetic databases for improving sheep genetics, microphone recordings of cattle to estimate forage intake, high resolution soil maps for precision management and phone Apps for quick access to information. The event was a great opportunity to highlight future applications and show the direction the Center is headed. We look forward to future stakeholder meetings where all can come learn more about our research applications!

Congressional technology visit



USDA-ARS, DBSFRC Technology Handout



Dr. Christine Nieman's Cattle Research Spotlight



Dr. Christine Nieman

Fall brings our summer grazing study to an end. The study evaluated three different options for summer forages, a warm season perennial pasture typical of most Arkansas pastures (bermudagrass, crabgrass, broom-sedge, and some warm season annuals such as foxtails) (Figure 1), sorghum-sudangrass only (Figure 2), and a sorghum-sudangrass plus cowpea mixture ("mixtures" were created with alternating drill passes of sorghum-sudangrass and cowpeas) (Figure 3).

In Arkansas, summer stockers generally graze warm season perennial pastures which can be low in energy and protein, requiring supplementation to maintain maximum average daily gain (ADG) over the summer. Cattle gains from previous research using un-supplemented stocker calves in Arkansas range from 1 to 1.5 lb per day. Cattle gains on sorghum-sudangrass can be high to moderate, with previous research from Texas recording gains of 2.4 lb per day and 390 lb per acre in just 84 days. However, stocker performance on sorghum-sudangrass may suffer when plants reach maturity and forage nutritive value declines. To overcome this potential reduction in gain, a legume, such as cow peas, can be utilized to maintain high crude protein and energy levels.

The cool, wet spring in 2021 resulted in a late start to grazing the warm season perennial pasture (June 10) and a late planting for the warm season annuals (June 16-17). Grazing started on annual species on July 15, giving the warm season perennial treatment a month head start. Eight stocker steers weighing an average of 680 lb at the beginning of the study, were assigned to each 4.5-acre pasture. Each treatment had three replicates, resulting in 3 - 4.5-acre pastures for each treatment. Each pasture was rotationally grazed with 4 allocations, and cattle rotated approximately every 10 days resulting in a 28-d rest period. Grazing ended early on all treatments because of drought. All perennial warm season pastures and two sorghum-sudangrass plus cowpea pastures were more severely affected and grazing ended on those pastures on September 9 (Figure 4). (continued on page 4)



Figure 1. Perennial Summer Pasture



Figure 2. Sorghum only Pasture



Figure 3. Sorghum plus Cowpeas Pasture



Figure 4. Bermuda grass Pasture in September

(continued from page 3) Sorghum-sudangrass pastures were grazed until September 21 because of forage mass accumulation that occurred prior to the drought (Figure 5). Therefore, the grazing sessions for each treatment averaged 91 days for the perennial warm season, 68 days for sorghum-sudangrass only, and 60 days for sorghum-sudangrass plus cowpea. Forage nutrient concentrations and yield analyses will be conducted, and the study will be repeated in 2022. After the first year, we learned that both sorghum-sudangrass and cowpeas were sensitive to wetter pastures, with slower growth and sometimes no growth of cowpea plants (Figure 6). Cattle avoided consuming cowpeas in the first rotation, but after being forced to consume them before rotating to the next paddock, they became familiar with them and readily ate the cowpeas in the next allocation. Average Daily Gain (ADG) over the entire grazing season was 1.7 lb per day in the perennial warm season treatment, 2.1lb per day in the sorghum-sudangrass treatment, and 2.3 lb per day in the sorghum-sudangrass plus cowpea treatment. Gain per acre was 277, 256, and 243 lb per acre for the perennial warm season pasture, sorghum-sudangrass only, and sorghum-sudangrass plus cowpea treatments, respectively. Late planting resulted in short grazing seasons for the annual systems. Though ADG was superior in the annual systems, the greater grazing days in the perennial warm season pasture resulted in greater gain per acre. The final evaluation will include forage nutritive value and an economic comparison, including ADG, grazing days, and the input costs for each system.

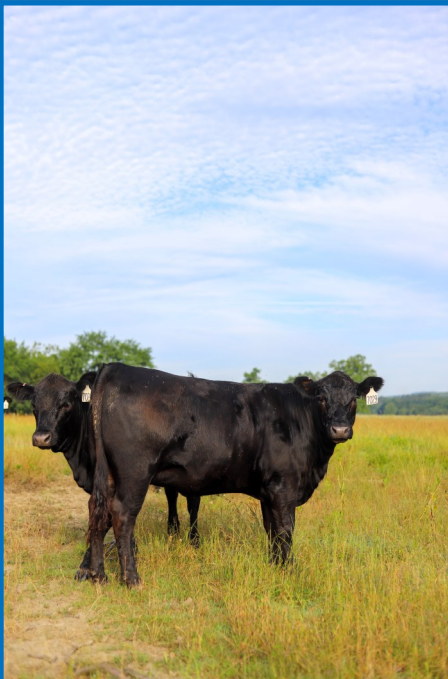


Figure 5. Sorghum September



Figure 6. Poor establishment in wetter pastures

Cattle Program Update



Fall is another busy time for the cattle crew at the Dale Bumpers Small Farm Research Center. We have finished up with the cooperator cattle and now we're preparing for Fall vaccinations, pregnancy checking and weaning. Cows will receive one round of vaccinations and a vet will perform a pregnancy check. Each calf will receive 2 rounds of vaccines 3 weeks apart before being weaned to minimize stress of vaccinations. The calves will be monitored for at least 45 days after weaning before leaving the DBSFRC. Fall means it is time to look at available forage in our pastures and determine when and if we should rotate pastures or provide additional forage such as hay or feed. We also need to make sure water sources are winterized, to avoid frozen pipes and interrupted water supply to the pastures. After all the preparations in the Fall, our cattle should be ready for the colder weather.

Dr. Joan Burke's Small Ruminant Research Spotlight



Dr. Joan Burke

The small ruminant crew has been busy preparing for lambing, with 115 ewes to lamb and expecting over 200 lambs in the month of October. Lambing is an exciting time, the pastures fill up with bouncing lambs and research ramps up with many research observations collected to evaluate new trait complexes and further the development of genetic tools for stakeholders to use in the selection of more profitable and healthy sheep.

This fall the small ruminant crew prepared and planted over 120 acres of organic and conventional pastures. Forage planted includes wheat, rye, vetch, oats, mustard, rapeseed and clover. This will extend the grazing season by providing nutritious forages during the fall and early spring months.



The crew has also been moving forward with pasture and facility renovations and improvement. A few of these improvements include designing new facilities for the organic pastures to improve animal flow and eradicating thorn trees in these areas. They have installed another animal working system at Small Ruminant Central that makes sheep handling less stressful and much more efficient for both the livestock and the producer. This system is designed to encourage sheep to move freely through the alleyway onto the scale, and has also improved worker and animal safety. It includes a digital weighing system and digital ID reading system. The crew has also installed shedding brushes in most small ruminant pastures. Katahdin sheep do not have wool. They are a hair sheep which shed in the spring, and they scratch against any surface that will aid in the process of shedding. This can be damaging to fences and facilities within the pasture, therefore adding the shedding brushes have given the animals a great alternative and helped deter damage to infrastructure.



Copper wire boluses made with gel capsules

Copper Boluses for Parasite Treatment Podcast Interview

Dr. Joan Burke discussed copper boluses for parasite treatment in a recent ASI Research Update podcast. "There's something in the toolbox that is available to producers that many aren't even aware of or know little about," said podcast host Jake Thorne of Texas A&M AgriLife. "Copper oxide wire particles might be the missing piece to your parasite management protocol." Dr. Burke said that she looked into copper oxide wire particles as a way to develop research that

would have a significant impact on farmers and ranchers and their sheep flocks. (continued on page 6)



Non-ARS stock photo of bottle jaw (a symptom of Pole Barber Worm infestation)

(continued from page 5) “It was recognized more than 20 years ago that there was a need for alternatives to chemical dewormers because of dewormer resistance,” she said, adding that the use of copper oxide wire particles allows for organic livestock production. “Early on, copper oxide wire particles had been discovered to be effective against barber pole worm. Copper oxide wire particles are sold commercially as boluses or in gel capsules with little particles of copper oxide within.”

To listen to the podcast click on this link: [Stream ASI Research Update: Copper Boluses for Parasite Treatment with Dr. Joan Burke by American Sheep Industry Association | Listen online for free on SoundCloud](#). There are additional resources on use of copper oxide

wire particles for control of gastrointestinal nematodes on the American Consortium for Small Ruminant Parasite Control website, www.wormx.info. There will soon be a Spanish translated fact sheet on copper oxide wire particles as well as other topics.

IACUC Year End Update by Erin Wood

At the Dale Bumpers Small Farms Research Center we hold animal welfare to the highest standards while producing impactful research for small farmers. The Institutional Animal Care and Use Committee (IACUC) oversees all animal research and ensures the compassionate care and ethical oversight of all animals used in research. The committee is made up of no less than five members which includes a qualified veterinarian, an animal scientist, a community member, and a non-scientist. They are responsible for inspecting facilities, reviewing the animal program and all research in progress, ensuring all employees are appropriately trained, and establish standard operating procedures for common procedures and situations on location. The IACUC oversaw 9 active protocols including cattle and sheep in FY2021. Topics being explored includes grazing of warm season grasses and exploring different uses of a commercial feed additive used to control the spread of parasitic larvae in the pasture and other exciting topics that will aid in making small farms more profitable.

Staff Spotlight- Sarah Hayward, New Position



In September 2021, Sarah Hayward was hired as an Animal Caretaker with the DBSFRC to deliver daily care to sheep and guard animals, maintain pastures and assist in research projects. Sarah grew up in a little community outside Booneville, known as lone. She grew up on a family beef cattle farm. She was active in 4-H and FFA for 14 years and showed at the county, district, and state levels. In 2005, Sarah started working at a local dairy farm, milking cows twice a day. The dairy closed in 2014. Sarah attended Southern Arkansas University in Magnolia, Arkansas and achieved a B.S. degree of General Studies in Agriculture. In 2015, she worked as a Ranch Foreman managing a cow/calf operation consisting of about 400 head of beef cattle.

In 2016, she began a career with the U.S. Forest Service at the Poteau/Cold Springs Ranger District. Sarah marked timber as a Forestry Technician. Then in 2017 Sarah was hired with the DBSFRC as a Biological Science Aid caring for sheep, guard animals and cattle. Congratulations to Sarah for her new position.

Dr. Zamir Libohova's Soils Research Spotlight



Dr. Zamir Libohova

2021 Arkansas GIS Virtual Symposium Meeting September 14-15, 2021 by Dr. Libohova

Dr. Zamir Libohova and Dr. Phillip Owens from the Dale Bumpers Small Farms Research Center along with Dr. Amanda Ashworth from the USDA ARS Poultry Production and Products Safety Research Unit in Fayetteville participated in the virtual meeting of the Arkansas GIS Users Forum (argisusers.org). The Arkansas GIS Users Forum is composed of geospatial professionals from a

variety federal, state, county, and local governments, as well as private and nonprofit organizations that develop, publish, distribute, and use geospatial information. The title of the presentation was "GIS, machine learning and digital soil mapping: creating fine-resolution data for farm management". The objective of this presentation was to demonstrate the value of the machine learning and artificial intelligence (AI) as a step toward a holistic approach for developing tools for precision farm management. The increasing demands for food and fiber while providing ecological services from soils relies on proper management of natural resources, especially at the farm-level. We presented few examples from Arkansas about producing high resolution detailed soil maps as the first step toward building an AI infrastructure and shared a vision about incorporating multiple sources of data to increase the efficiency of farm operations

under limited resources. Overall, precision agriculture and its component technologies and techniques such as digital soil mapping and remote sensing can improve on-farm efficiencies needed to reduce input-use and improve yields for sustainable intensification. Recent developments on remotely sensed data collection from multiple sensors, storage data capacities, (continued on page 8)



Dale Bumpers Small Farms Research Center Topographic Wetness Index and Available Water Capacity



The wetness index which shows the surface runoff or areas that could potentially accumulate water or divert it away shows that there is a lot more variability in soil moisture distribution than current soil maps show. This information is critical for managing crops, pastures and animals within farm fields

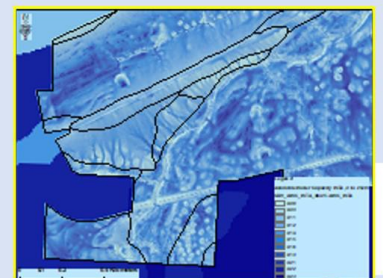
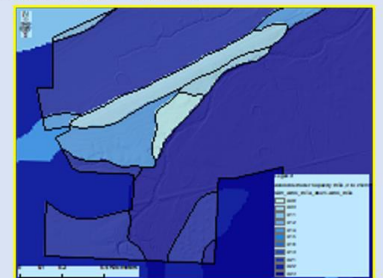


Figure 1. This example from the Dale Bumpers Small Farms Research Center shows the detailed map of the Topographic Wetness Index that is more detailed compared to the current available soil maps. This information in combination with soils, plants, animals and weather would support farm management decisions at the field level.

(continued from page 7) data mining and machine learning techniques to process and analyze these data provides an opportunity to support precision management decisions at greater spatial and temporal details than previously envisioned. Machine learning has been identified as the most promising approach to analyze the vast amount of data which in turn can apply to artificial intelligence to provide management options for small farms. The AI can benefit from high spatial and temporal resolutions data on soils, water movement, vegetation, animals, and market prices to support precision farm-level management decisions. The presentation received a lot of interest and generated many questions and discussions about how the new spatial technologies can help farmers and other users in general. The work at Dale Bumpers Small Farms Research Center continues to explore the possibilities of technology applications for small farms in Arkansas.

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<https://www.ars.usda.gov/southeast-area/booneville-ar/dale-bumpers-small-farms-research-center/>

Preferential flow under high-intensity short-duration irrigation events in soil columns from a karst and nonkarst landscape Sheela Katuwal, Amanda J. Ashworth, Philip R. Owens

To read journal article click on: [Vadose Zone Journal DOI: 10.1002/vzj2.20160](https://doi.org/10.1002/vzj2.20160)



Novel Nutrient Management Method: Applying Poultry Litter in Subsurface Bands by Nina Prater

To read article click on or go to ATTRA website:

<https://attra.ncat.org/novel-nutrient-management-method-applying-poultry-litter-in-subsurface-bands/#:~:text=Novel%20Nutrient%20Management%20Method%3A%20Applying%20Poultry%20Litter%20in%20Subsurface%20Bands>

In Remembrance...



Michael Ralph Rogers passed away on Tuesday, October 19, 2021, in Fort Smith, Arkansas. He was born July 30, 1961, He retired from the DBSFRC after 28 years of service. He was a member of the Living Word Tabernacle in Booneville and a member of the "Rogers Chain Gang" at the Bearcat football games for many years. He was also a 1980 graduate of Booneville High School and enjoyed mowing yards, talking to people, and dancing. Obituary at : [Bulger Funeral Home of Booneville \(bulgerfh.com\)](http://bulgerfuneralhome.com)

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